THE INVENTION CLAIMED IS

1. A compact reflective imaging spectrometer apparatus, comprising:

an entrance slit for directing light,

a first mirror that receives said light and reflects said light,

an immersive diffraction grating that diffracts said light,

a second mirror that focuses said light, and

a detector array that receives said focused light.

2. The compact imaging spectrometer apparatus of claim 1 wherein said immersive diffraction grating has rulings immersed into a wedged germanium or zinc selenide prism.

3. The compact imaging spectrometer apparatus of claim 1 wherein said immersive diffraction grating has rulings immersed into a flat germanium or zinc selenide grating.

4. The compact imaging spectrometer apparatus of claim 1 wherein said immersive diffraction grating has equally spaced straight rulings.

5. The compact imaging spectrometer apparatus of claim 1 wherein said immersive diffraction grating has rulings that have varying ruling spacings and that may be curved for better aberration correction.

6. The compact imaging spectrometer apparatus of claim 1 wherein said immersive diffraction grating has rulings that are cut on the plano side of a wedged plano-convex or plano-concave lens.

7. The compact imaging spectrometer apparatus of claim 1 wherein said immersive diffraction grating has rulings that are diamond flycut with a blazed profile.

8. The compact imaging spectrometer apparatus of claim 1 wherein said first mirror is a concave reflective primary mirror.

9. The compact imaging spectrometer apparatus of claim 1 wherein said second mirror is a concave reflective secondary mirror.

10. The compact imaging spectrometer apparatus of claim 1 wherein said apparatus has a front and a back, and wherein said entrance slit and said detector array are located at or near said font, and wherein said second mirror that focuses said light is located at or near said back.

11. An infrared reflective imaging spectrometer apparatus, comprising:

an entrance slit for directing light,

a concave reflective primary mirror for reducing the divergence of said light from said entrance slit,

a wedged germanium or zinc selenide immersed grating dispersing said light,

and

a concave reflective secondary mirror focusing said light onto a two-dimensional detector array.

12. The infrared reflective imaging spectrometer apparatus of claim 11 wherein said wedged germanium or zinc selenide grating has a wedge angle that provides slit curvature correction and wherein said light passes through said wedged germanium or zinc selenide grating substrate and is spectrally dispersed by said reflecting immersed grating.

13. The infrared reflective imaging spectrometer apparatus of claim 11 wherein said wedged grating is transmissive. The light passes through the grating and is dispersed by the transmissive grating rulings

14. The infrared reflective imaging spectrometer apparatus of claim 11 wherein the said concave reflective primary and said concave reflective secondary mirror have conic sections or rotational aspheric sections or toric sections.

15. The infrared reflective imaging spectrometer apparatus of claim 11 wherein said wedged germanium or zinc selenide grating is a conventional straight grooved grating.

16. The infrared reflective imaging spectrometer apparatus of claim 11 wherein said wedged germanium or zinc selenide grating is a holographic grating that provides further aberration and distortion correction.

17. The infrared reflective imaging spectrometer apparatus of claim 11 wherein said wedged germanium or zinc selenide grating is a diffraction grating with non-uniform groove spacings.

18. The infrared reflective imaging spectrometer apparatus of claim 11 wherein said wedged germanium or zinc selenide grating is a diffraction grating with curved groove spacings that provide further aberration and distortion correction.

19. The infrared reflective imaging spectrometer apparatus of claim 11 wherein power is added to surfaces of said wedged grating for greater distortion and field curvature correction.

20. The infrared reflective imaging spectrometer apparatus of claim 11 wherein other optical materials for said wedged grating are substituted to enhance the transmittance in the near, mid or long wave infrared regions.

21. The infrared reflective imaging spectrometer apparatus of claim 11 wherein optical materials for said wedged grating are materials that transmit visible light for operation in the visible spectral region.

22. The infrared reflective imaging spectrometer apparatus of claim 11 including a lens added in front of said detector array to control the field curvature.

23. An infrared reflective imaging spectrometer, comprising:

an entrance slit for admitting light,

a concave reflective primary mirror focusing said light from said entrance slit,

a convex reflective secondary mirror diverging said light,

a wedged germanium or zinc selenide immersed grating for dispersing said light, said wedged germanium or zinc selenide grating having a wedge angle providing slit curvature correction, wherein said light passes through said wedged germanium or zinc selenide grating to be spectrally dispersed by said reflecting immersed grating,

a convex reflective tertiary mirror diverging said light; and

a concave reflective quaternary mirror focusing said light onto a two-dimensional detector array.

24. The infrared reflective imaging spectrometer apparatus of claim 23 wherein said wedged germanium or zinc selenide grating has a wedge angle that provides slit curvature correction and wherein said light passes through said wedged germanium or zinc selenide grating substrate and is spectrally dispersed by said reflecting immersed grating.

25. The infrared reflective imaging spectrometer apparatus of claim 23 wherein some or all of said primary, secondary, tertiary and quaternary mirrors have conic sections or rotational aspheric sections or toric sections for further aberration correction.

26. The infrared reflective imaging spectrometer apparatus of claim 23 wherein the said wedged grating is transmissive.

Wherein the said light passes through said grating and is spectrally dispersed by transmissive grating grooves.

27. The infrared reflective imaging spectrometer apparatus of claim 23 wherein said wedged germanium or zinc selenide grating is a conventional straight grooved grating.

28. The infrared reflective imaging spectrometer apparatus of claim 23 wherein said wedged germanium or zinc selenide grating is a holographic grating that provides further aberration and distortion correction.

29. The infrared reflective imaging spectrometer apparatus of claim 23 wherein said wedged germanium or zinc selenide grating is a diffraction grating with non-uniform groove spacings.

30. The infrared reflective imaging spectrometer apparatus of claim 23 wherein said wedged germanium or zinc selenide grating is a diffraction grating with curved groove spacings that provide further aberration and distortion correction.

31. The infrared reflective imaging spectrometer apparatus of claim 23 wherein power is added to surfaces of said wedged grating for greater distortion and field curvature correction.

32. The infrared reflective imaging spectrometer apparatus of claim 23 wherein other optical materials for said wedged grating are substituted to enhance the transmittance in the near, mid or long wave infrared regions

33. The infrared reflective imaging spectrometer apparatus of claim 23 wherein optical materials for said wedged grating are materials that transmit visible light for operation in the visible spectral region.

34. The infrared reflective imaging spectrometer apparatus of claim 23 including a lens added in front of said detector array to control the field curvature.